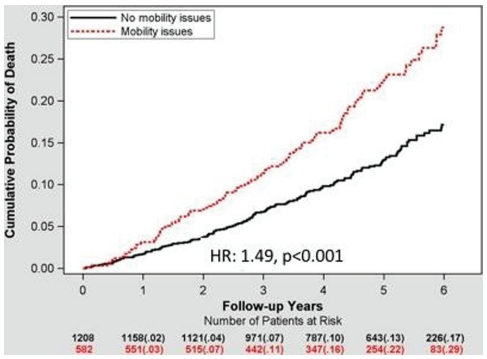

Kaplan-Meier analysis Mobility

iety/depression predicted heart failure events. Simple assessment of quality of life in HF patients before CRT implantation using the EQ-5D questionnaire might provide a robust tool to predict long-term outcomes.

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Cardiac resynchronization therapy in elderly: Predictors of mortality at 12-months follow-up

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Background: The decision to implant a cardiac resynchronization therapy (CRT) device and particularly a CRT defibrillator may be challenging in older patients, due to the difficulty in evaluating their life expectancy. Nonetheless, CRT in the elderly is of major relevance as heart failure prevalence increases with age.
Purpose: To assess 12-months survival after CRT implantation in patients aged ≥75 years and to identify predictors of 12-months mortality.
Methods: We prospectively analyzed clinical, instrumental data and survival of ≥75 years-old patients who received a CRT device in the CRT-MORE registry from 2011 to 2014. The primary endpoint was total mortality at 12 month follow-up. Adverse events for the analysis of clinical outcome comprised nonfatal HF events requiring hospitalization. Clinical Composite Score (CCS) was also evaluated at 12 month follow-up.
Results: We included 345 patients (mean age 80 years, 30% male, 50% ischemic, 78% with defibrillator backup). After 12 months, 20 patients had at least one HF hospitalization, 30 died and 4 had both events. The resulting survival rate at 12-months was 90%. 43% of the pts displayed an improvement in their CCS at 12 months, 37% were classified as unchanged and the remaining 20% as worsened. At multivariate Cox regression analysis adjusted for baseline confounders, age>80 years [HR=2.45; 95% CI: 1.19–5.05; p=0.016], chronic obstructive pulmonary disease [HR=2.88; 1.47–5.65; p=0.0022] and impaired renal function [HR=2.95; 1.45–5.97; p=0.0029] remained associated with death. Then, we gathered all factors into a mortality score (i.e. the number of factors): 0 (very low risk; 99 pts – 28.7%, survival rate 98%), 1 (low risk; 143 pts – 41.5%, survival rate 94.4%), 2 (intermediate risk; 86 pts – 24.9%, survival rate 80.2%), 3 (high risk; 17 pts - 4.9%; survival rate 58.8%). In comparison with patients with very low to low risk profile, the time to death was significantly shorter in patients with an intermediate to a high risk profile (log-rank test, HR=6.24; 2.95–13.21; p<0.0001). Pts with accumulated risk factors (RF) displayed a trend toward lower response at 12 months as assessed by CCS (33.7% of pts with 2 or 3 RF vs 46.3% of pts with none or 1 RFs improved their status, p=0.203) and higher rate of hospitalizations for HF (9.7% vs 5.8%, p=0.246).
Conclusion: All-cause mortality was considerably higher in the group of elderly patients with accumulated risk factors. A proper characterization of baseline parameters can be helpful for the evaluation and risk stratification of these patients prior to making a decision of implanting a CRT-P or CRT-D device.

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Machine learning to identify high-risk clusters of patients undergoing cardiac resynchronization therapy

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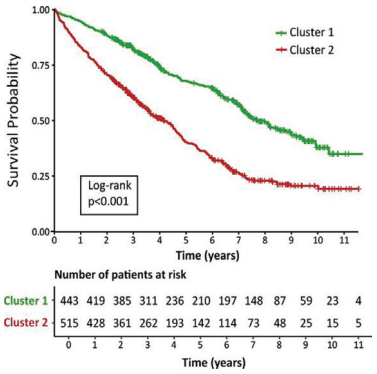
Background: Cardiac Resynchronization Therapy (CRT) has been shown to improve mortality and cardiac function in patients with chronic systolic heart failure (HF) and prolonged QRS. However, the beneficial response is multifactorial. Consequently, a reliable method is warranted to identify vulnerable patients by risk stratification for long-term mortality.
Purpose: We sought to generate an unsupervised machine learning model based on baseline clinical characteristics of pre-procedural assessment to risk-stratify patients undergoing CRT implantation.
Methods: After CRT implantation, 958 patients (67±10 years, 244 [25%] females) were followed up for median of 1325 days. Prior to implantation, all patients underwent comprehensive clinical evaluation including assessment of cardiovascular risk factors, laboratory tests, and echocardiographic examination. Lasso penalty regularized Cox Proportional Hazard model was used to identify features with high predictive power to perform hierarchical clustering.
Results: During the follow up period 527 (55%) deaths occurred. The selected parameters included gender (male, Hazard Ratio [HR]=1.62, 95% Confidence Interval [CI], 1.27–2.08, p<0.001), age (HR=1.03, 95% CI, 1.02–1.04, p<0.001), valvular heart disease (HR=1.56, 95% CI, 1.19–2.05, p=0.001), diabetes mellitus (HR=1.23, 95% CI, 1.03–1.47, p=0.021), ischemic etiology (HR=1.35, 95% CI, 1.08–1.68, p=0.008), hemoglobin (HR=0.91, 95% CI, 0.87–0.96, p<0.001), blood urea nitrogen (HR=1.03, 95% CI, 1.01–1.05, p<0.001), early diastolic transmitral flow velocity (HR=1.01, 95% CI, 1.01–1.02, p=0.007), late diastolic transmitral flow velocity (HR=0.99, 95% CI, 0.98–0.99, p=0.005), CRT-Defibrillator (HR=0.72, 95% CI, 0.59–0.88, p<0.001), digoxin- (HR=1.44, 95% CI, 1.18–1.76, p<0.001), and statin usage (HR=1.23, 95% CI, 1.01–1.50, p=0.035). The unsupervised clustering algorithm identified two distinct clusters. The survival curves of the clusters (Figure 1) differed significantly (Log-rank test, p<0.001). The risk of mortality more than doubled in patients in the second cluster (HR=2.19, 95% CI, 1.83–2.62, p<0.001). Patients in the first cluster was found to have higher left ventricular ejection fraction (cluster 1 vs cluster 2, 30±7 vs 28±7%, p<0.001) and Tricuspid Annular Plane Systolic Excursion (22±5 vs 18±5mm, p<0.001), but lower N-terminal pro B-type Natriuretic Peptide values (2264±2333 vs 3155±4017 pmol/L, p=0.013).



Conclusion: Hierarchical clustering is a robust method to recognize distinct patterns in patients' clinical characteristics, and might be able to identify high and low risk subpopulations. Therefore, machine learning may facilitate optimal risk stratification of patients undergoing CRT implantation and may enable better HF management.

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Longitudinal changes in ventricular repolarization in patients with CRT and its relation to ventricular tachyarrhythmias

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Background: Cardiac resynchronization therapy (CRT) is an effective treatment option for patients with advanced heart failure and wide QRS complexes. However, the effect of biventricular pacing on repolarization parameters and its relation to arrhythmias are not well understood.
Purpose: The aim of our study was to evaluate changes of ventricular repolarization after CRT implantation and its relation to ventricular tachyarrythmias (VTs).
Methods: High-resolution Holter ECGs were recorded at baseline, 1, 3, 6, 9, and 12 months after implantation of a CRT-D device in 64 patients (age 63.9±10.9; 47 male (73%); 23 ischaemic aetiology (36%); EF 27% (23–31)). Biventricular pacing was temporarily inhibited during follow-up visit to record intrinsic ECG. T-wave amplitude variability, QTa interval (QT apex), QTe interval (QT end), Tpeak to Tend interval (TpTe), and TpTe/QT ratio were analysed from 20-minute high-resolution ECG recordings. Patients with a decrease of ESV ≥15% were considered as responders. VTs were classified as sustained ventricular tachycardia with appropriate ICD therapy or ventricular fibrillation.
Results: Significant increase of repolarization heterogeneity in the first months after CRT implantation was observed (P<0.05), which then declined during 12 months of follow-up (Fig. 1A,B). Appropriate device therapy was observed in 10 patients (15.6%) within 1 year after CRT implantation. Six patients (60%) had VTs during the first month after implantation. Distribution of VTs with the highest incidence in the first month corresponded with the highest repolarization hetero-